WS2812-2020

Intelligent control LED integrated light source

Features and Benefits

- The control circuit and the LED share the only power source.
- Control circuit and RGB chip are integrated in a package of **2020** components, to form a complete addressable pixel.
- Built-in signal reshaping circuit, after wave reshaping to the next driver, ensure wave-form distortion not accumulate.
- Built-in electric reset circuit and power lost reset circuit.
- Each pixel of the three primary color can achieve 256 brightness display, completed 16777216 color full color display, and scan frequency is of **2KHz**.
- Cascading port transmission signal by single line.
- Any two point the distance not more than 3m transmission signal without any increase circuit.
- When the refresh rate is 30fps, cascade number are not less than 1024 pixels.
- Send data at speeds of 800Kbps.
- The color of the light is highly consistent, cost-effective..

Applications

- Full-color module, Full color soft lights a lamp strip.
- LED decorative lighting, Indoor/outdoor LED video irregular screen.

General description

WS2812-2020 is an intelligent control LED light source, its exterior adopts the latest MOLDING packaging technology, the control circuit and RGB chips are integrated in a package of **2020** component. Its internal includes intelligent digital port data latch and signal reshaping amplification drive circuit. Also include a precision internal oscillator and a voltage programmable constant current control part, effectively ensuring the pixel point light color height consistent.

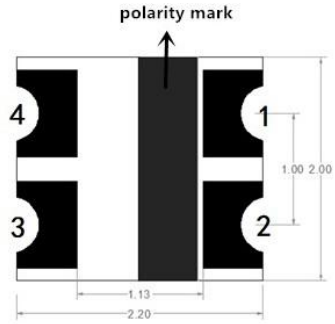
The data transfer protocol use single NZR communication mode. After the pixel power-on reset, the DIN port receive data from controller, the first pixel collect initial 24bit data then sent to the internal data latch, the other data which reshaping by the internal signal reshaping amplification circuit sent to the next cascade pixel through the DO port. After transmission for each pixel, the signal to reduce 24bit. pixel adopt auto reshaping transmit technology, making the pixel cascade number is not limited the signal transmission, only depend on the speed of signal transmission.

RESET time>**280μs** , it won't cause wrong reset while interruption, it supports the lower frequency and inexpensive MCU.

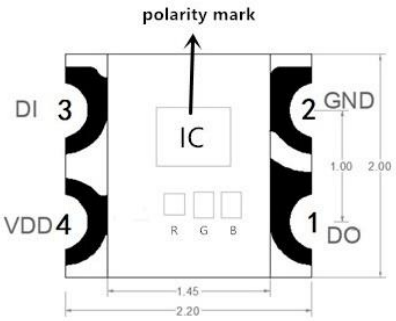
Refresh Frequency updates to **2KHz**, Low Frame Frequency and No Flicker appear in HD Video Camera, it improve excellent display effect.

LED with low driving voltage, environmental protection and energy saving, high brightness, large scattering angle, good consistency, low power, long life and other advantages. The control chip integrated in LED above becoming more simple circuit, small volume, convenient installation.

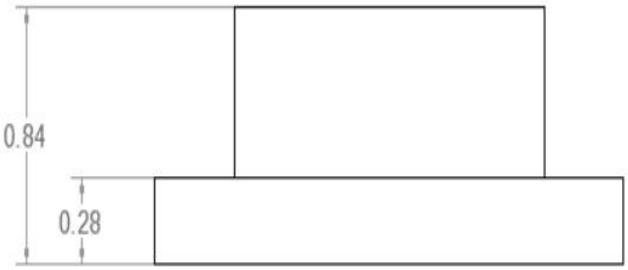
Mechanical Dimensions



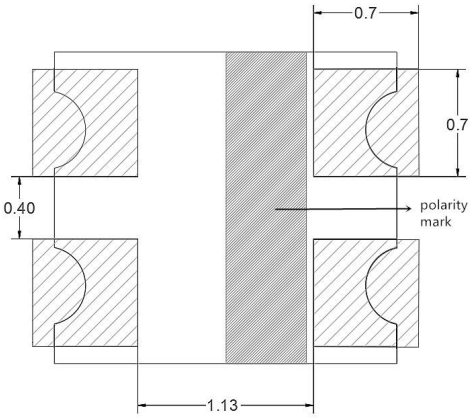
Back View



Top View

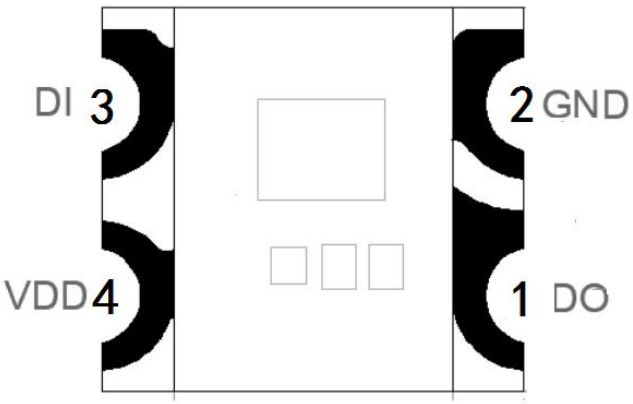


Side View



PCB Solder Pad

PIN Configuration



PIN Function

NO.	Symbol	PIN	Function description
1	DO	DATA OUT	Control data signal output
2	GND	GROUND	Ground, data & power grounding
3	DI	DATA IN	Control data signal input
4	VDD	POWER SUPPLY	Power supply

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power supply voltage	V_{DD}	+3.7~+5.3	V
Logical Input Voltage	V_I	2.7～VDD+0.5	V
Operation junction temperature	Topt	-25～+85	℃
Storage temperature range	Tstg	-40~+105	℃

Electrical Characteristics（T_A=-20～+70℃, V_{DD}=4.5～5.5V, V_{SS}=0V, unless otherwise specified）

Parameter	Symbol	Min	Tpy	Max	Unit	Conditions
Input current	I_I	——	——	±1	μA	V_I=V_{DD}/V_{SS}
Input voltage level	V_{IH}	0.7V_{DD}	——	——	V	D_{IN}, SET
	V_{IL}	——	——	0.3 V_{DD}	V	D_{IN}, SET
Hysteresis voltage	V_H	——	0.35	——	V	D_{IN}, SET

Switching Characteristics（T_A=-20～+70℃, V_{DD}=4.5～5.5V, V_{SS}=0V, unless otherwise specified）

Parameter	Symbol	Min	Tpy	Max	Unit	Condition
Transmission delay time	t_{PLZ}	——	——	300	ns	CL=15pF, DIN→DOUT, RL=10KΩ
Fall time	tTHZ	——	——	120	μs	CL=300pF, OUTR/OUTG/OUTB
Input capacity	C_I	——	——	15	pF	——

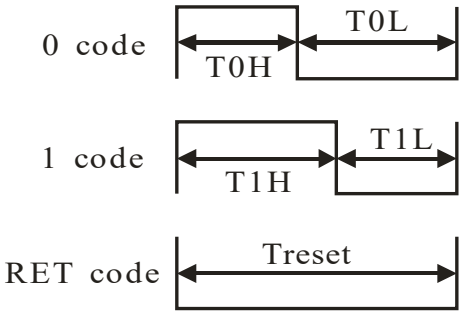
LED Characteristics

Parameter	Symbol	Color	Min.	Typ.	Max.	Unit	Test Condition (Working current)
Luminous intensity	IV	RED	40	--	60	mcd	5mA
		GREEN	100	--	130		
		BLUE	30	--	50		
Wavelength	λd	RED	620	--	625	Nm	5mA
		GREEN	520	--	525		
		BLUE	460	--	465		

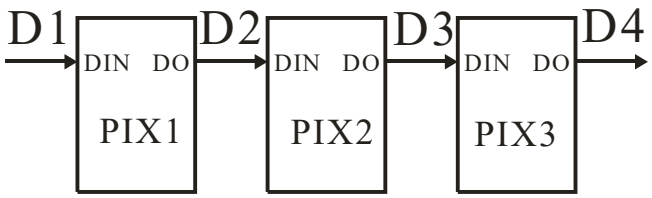
Data Transfer Time

T0H	0 code, high voltage time	220ns~380ns
T1H	1 code, high voltage time	580ns~1μs
T0L	0 code, low voltage time	580ns~1μs
T1L	1 code, low voltage time	220ns~420ns
RES	Frame unit, low voltage time	>280μs

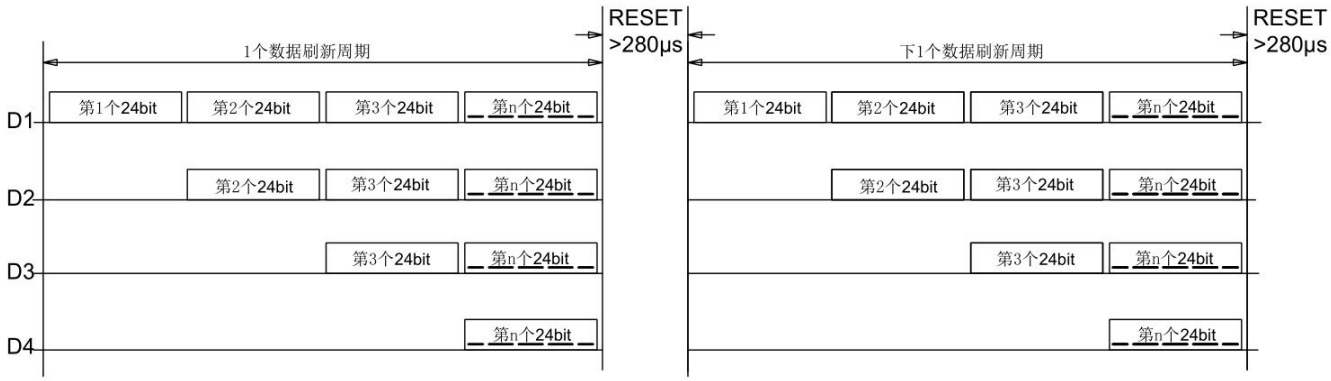
Sequence Chart



Cascade Method



Data Transmission Method



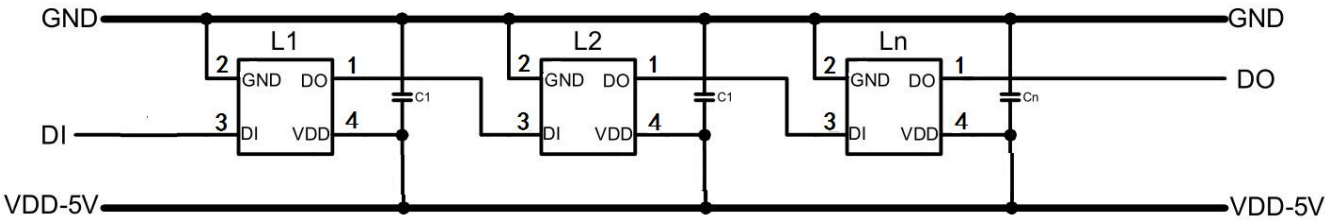
Note: The data of D1 is send by MCU, and D2, D3, D4 through pixel internal reshaping amplification to transmit.

Composition of 24bit Data

G7	G6	G5	G4	G3	G2	G1	G0	R7	R6	R5	R4	R3	R2	R1	R0	B7	B6	B5	B4	B3	B2	B1	B0

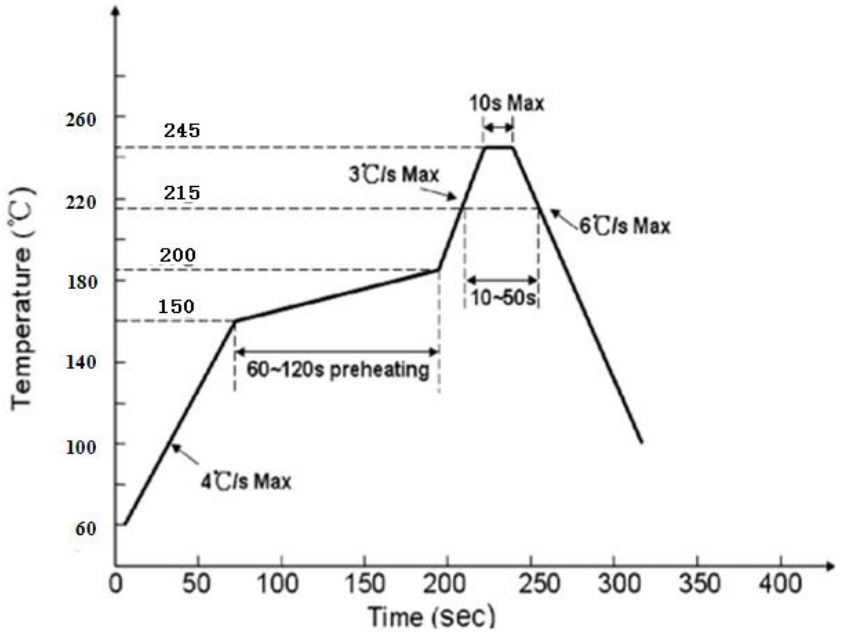
Note: Data transmit in order of GRB, high bit data at first.

Typical Application Circuit



Remarks: C1 is the filter capacitor for VDD, its value of 100NF.

Leade-free Reflow (SMT Line)



Curve Description	Lead-free Reflow Solder/SMT
The lowest preheat temperature (Tsmin)	150℃
The highest preheat temperature (Tsmax)	200℃
Preheating time (Tsmin to Tsmax) (ts)	60-180 S
Average rate of temperature rise (Tsmax to Tp)	<3℃/S
LIQUID REGION temperature (TL)	217℃
LIQUID REGION Holding Time (tL)	60-150 S
Peak Temperature (Tp)	245 ℃
High Temperature Region(Tp=-5℃) Holding Time (tp)	<10 S
Cooling Rate	<6℃/S
Room Temperature to Peak Holding Time	<6 min

◆ Reflow instruction

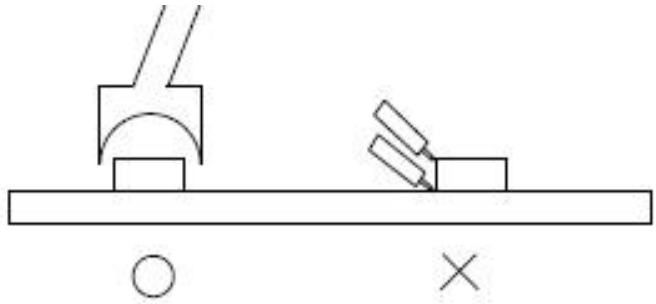
1. No more than two times of reflow.
2. Do not beat the colloid surface when the material is heated.

◆ Manual Soldering instruction

1. Soldering iron's temperature must be under 300℃, and operating time must be less than 3 seconds.
2. It should be done only once for the manual soldering.

◆ Repairing instruction

Normally, it can't be repaired after reflow. You need to use double-ended solder iron and make sure that whether it will do damage to the LEDs' characteristics when repairing is inevitable.



◆ Storing and Transporting

1. Scope of application

Front side up, moisture-proof and waterproof, no extrusion, no collision and no vibration.

2. Storage and period

① Room temperature sealed storage: "5℃～30℃, <85%RH", product is valid for TWO MONTH.

② Package opened: "5℃～3℃, <60%RH", use up in 96 hours (4 days) after opening package.

◆ Dehumidification

We would recommend to do dehumidification if they exceed the valid storage period of products or dampened due to other reasons.

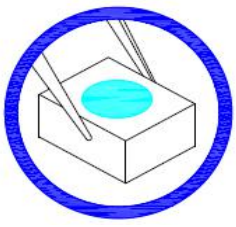
Dehumidification Method: 75℃/12Hours.

◆ Electrostatic Protection

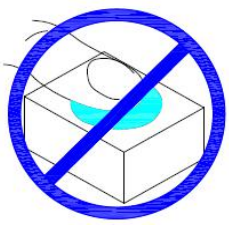
LED is an electrostatic sensitive component, although the LED products are with excellent anti-static ability, they will cause a certain damage by any electrostatic discharge. By taking some electrostatic measures to avoid the damages when using the LEDs, such as wearing anti-static gloves and anti-static bracelet, etc..

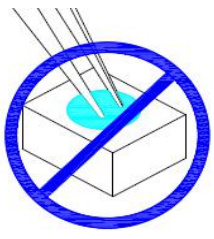
◆ Precautions

① Clip the LED from its side.

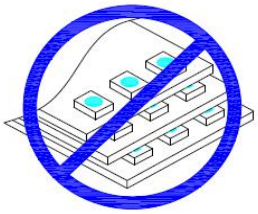


② Neither directly touch the gel surface with the hand or sharp instrument, it may damage its internal circuit.





③ Not to be double stacked, it may damage its internal circuit.



④ Can not be stored in or applied in the acidic sites of PH<7.

Modify Records

Version №	Status Bar	Modify Content Summary	Date	Reviser	Approved
V1.0	N	New	20180511	Shen JinGuo	Yin HuaPing

Remarks: Initial version: V1.0； Version number plus "0.1" after each revision；

Status bar: N--New, A--Add, M--Modify, D--Delete.